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Joseph C. Makarewicz

The College at Brockport, jmakarew@brockport.edu

Matthew J. Nowak

The College at Brockport

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Twelvemile Creek Niagara County, New York

Joseph C. Makarewicz and Matthew J. Nowak
The College at Brockport, State University of New York
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The east branch of Twelvemile Creek (69 mi²) flows through northern Niagara County to its mouth at Lake Ontario 12 miles east of the Niagara River, near the village of Wilson, New York. From fall through spring, good runs of steelhead and brown trout with the occasional Chinook and Coho salmon occur into the creek. Agriculture, especially row crop farming, is predominant within the watershed, though natural protected land is also plentiful. The Wilson-Tuscarora State Park provides a buffer between the creek and agriculture immediately around the mouth of the creek, while upstream farms directly line the creek. Nuisance algae, bacterial abundance, and algal mat development along the southern shoreline of Lake Ontario are major causes of beach closings, fouling the nearshore waters and limiting water recreation. This short report provides a synopsis of data collected monthly from May through September (2003 to 2009) on



Wilson Harbor at Twelvemile Creek, New York

the water quality of Twelvemile Creek and the lakeside (swimmable depth) of Lake Ontario near the mouth of the creek.

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Phosphorus is of concern as it stimulates the growth of plants, causing blooms of algae such as *Cladophora*. Twelvemile Creek is impacting the nearshore waters of Lake Ontario. Creek and lakeside phosphorus concentrations exceeded the NYSDEC ambient phosphorus guideline of 20 µg P/L (Table 2). Total phosphorus (TP) concentrations in the lakeside waters (average=31.3±6.68 µg P/L)(Fig. 1a) were generally lower than in creek water (average=53.9±9.1 µg P/L), indicating dilution with lake waters and perhaps uptake by algae. Over 302.9 kg/d (667.8 lbs per day) is being delivered by Twelvemile Creek to the nearshore waters of Lake Ontario or about 243,747 lbs per year (Table 1). Compared to TP concentrations in other Lake Ontario streams (83.8±7.0 µg P/L) and the open (9.5±0.7 µg P/L) offshore waters of Lake Ontario (Table 2), average TP concentrations in Twelvemile Creek (53.9±9.1 µg/L) and in the nearby lakeside waters (31.3±6.5 µg/L) were considerably lower. Chlorophyll concentrations at the creek (6.8±1.5 µg/L) and lakeside sites (4.9±1.4 µg/L) were generally lower than the average for other Lake Ontario lakeside sites (19.1±4.1 µg/L) and tributaries (6.5±0.8 µg/L). Water samples taken from Twelvemile Creek, as well as from the shore of Lake Ontario near the creek mouth, suggested that TP and soluble reactive phosphorus (SRP) concentrations may be decreasing over time both at the creek and along the lakeshore (Figs. 1a, b). This is particularly evident at the lakeside site (Fig. 1a, b). Nitrate, SRP, phycocyanin, and total Kjeldahl nitrogen showed no trends through the study period of 2003-2009. Seasonally, lakeside chlorophyll levels (Fig. 2c) mimicked TP (Fig. 2a) and sediment concentrations (total suspended solids) (Fig. 2e) with lower values in May, June, and August and higher values in July and September. Seasonally, nitrate decreased at the lakeside site while organic nitrogen increased (Figs. 2f, g). In the creek, no obvious seasonal patterns were observed (Fig. 3).

However, TP, SRP, and phycocyanin concentrations peaked while nitrate reached a minimum concentration in September.

References

- Makarewicz, J.C., and T. W. Lewis. 2000. Nutrient and sediment loss from a Niagara County watershed: The East Branch of Twelvemile Creek. A report prepared for the Niagara County Soil and Water Conservation District. Available from Drake Library, SUNY Brockport, Brockport, N.Y.
- Makarewicz, J.C., T.W. Lewis, and D. White. 2008. Characterization and prioritization of the watersheds of Niagara County, New York. Niagara County Soil & Water Conservation District. Available from Drake Library, The College at Brockport. 50p.

Table 1. Average (\pm SE) discharge and loading values for Twelvemile Creek from February 2006 thru December 2007 (from Makarewicz and Lewis 2000).

		Total Phosphorus (kg/day)	Nitrate (kg/day)
Nonevent	47,114 \pm 29,495 (0 - 671,238)	6.6 \pm 4.8 (0.0 - 108.1)	33.6 \pm 22.8 (0.0 - 523.6)
Event	540,251 \pm 122,614 (253,749 - 866,936)	302.9 \pm 116.8 (84.8 - 624.5)	330.4 \pm 66.5 (124.0 - 519.4)
Average	135,174 \pm 47,970 (0 - 866,936)	59.5 \pm 29.2 (0.0 - 624.5)	86.6 \pm 30.7 (0.0 - 523.6)

Table 2. Average concentrations (2003 to 2009, May through September) and standard errors (S.E.) of total phosphorus (TP), soluble reactive phosphorus (SRP), nitrate, Chlorophyll a (Chl a), phycocyanin, total suspended solids (TSS), total Kjeldahl nitrogen (TKN), sodium, and silica.

	TP (μ g P/L)		SRP (μ g P/L)		Nitrate (mg/L)		Chlorophyll (μ g/L)		Phycocyanin (μ g/L)		TSS (mg/L)		TKN (μ g/L)		Sodium (mg/L)		Silica (mg/L)	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
Lakeside	62.0	7.4	7.0	0.9	0.27	0.01	19.1	4.1	17.8	2.2	33.5	4.8	795	96	13.78	0.19	0.56	0.06
Rivers	83.8	7.0	44.8	5.4	0.57	0.03	6.5	0.8	13.2	3.0	10.5	1.9	559	25	26.65	1.28	1.42	0.15
Embayments	129.7	59.6	15.5	2.0	0.14	0.01	20.0	2.4	237.5	207.6	17.0	5.70	923	70	27.47	1.49	1.29	0.11
Lake Ontario 30m	9.9	0.7	3.1	0.5	0.31	0.02	2.0	0.17	5.5	1.2	0.7	0.14	253.3	21.0	11.46	0.23	0.35	0.05
Lake Ontario 100m	9.5	0.7	5.2	2.1	0.31	0.01	2.6	0.26	6.1	1.3	0.8	0.12	343.4	50.9	11.45	0.24	0.40	0.07

Map of the “North Coast” of New York showing sampling locations for the Lake Ontario Coastal Initiative. The Twelvemile Creek watershed is shown in the insert.

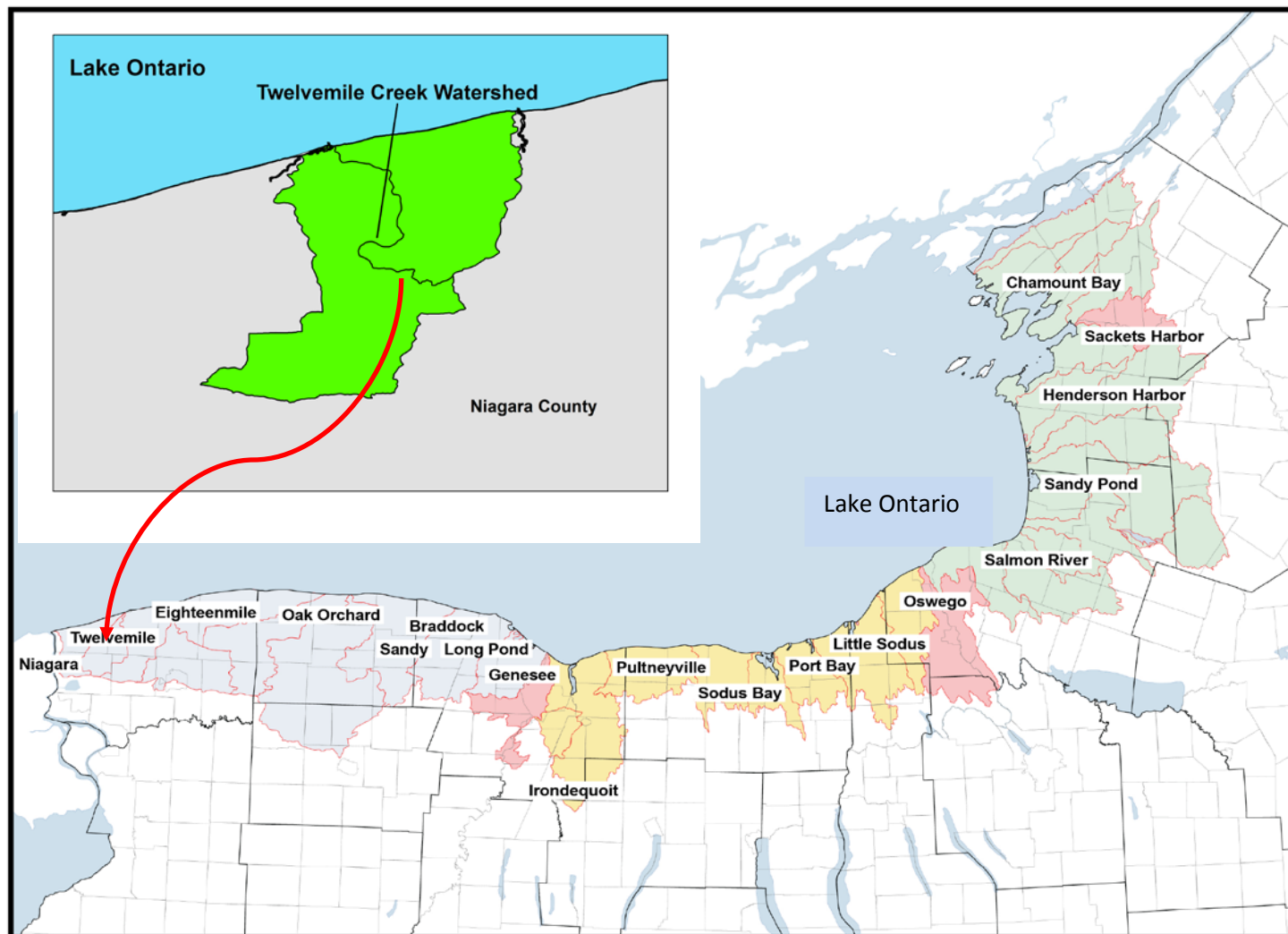


Figure 1. Average summer total phosphorus, soluble reactive phosphorus, chlorophyll a, phycocyanin, total suspended solids, nitrate, and total Kjeldahl nitrogen concentrations at the lakeside of Lake Ontario near Twelvemile Creek and Twelvemile Creek. Surface water samples were taken monthly (May-September) at a 1-meter depth.

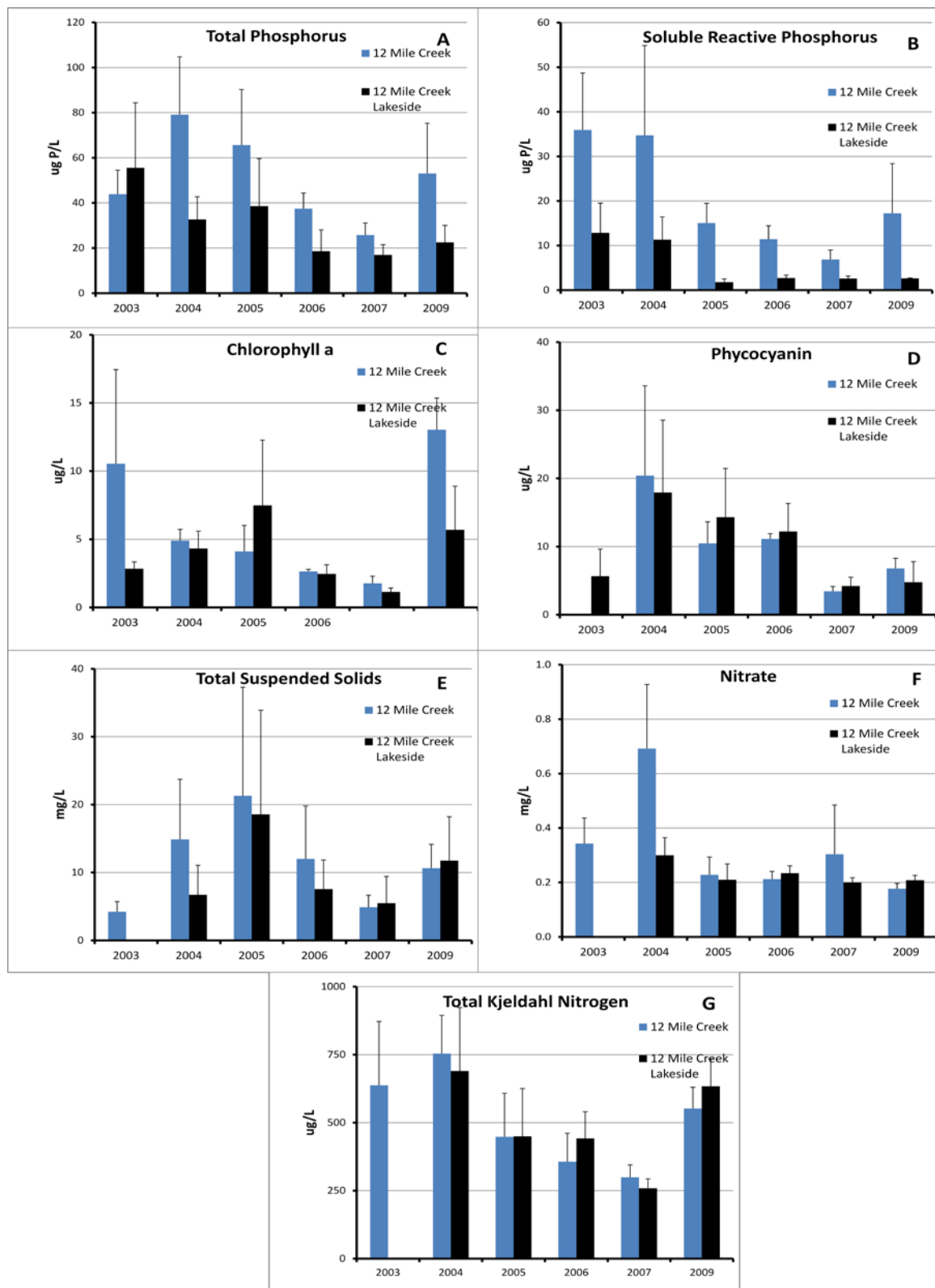


Figure 2. Average (\pm S.E) seasonal concentrations of total phosphorus, soluble reactive phosphorus, chlorophyll a, phycocyanin, total suspended solids, nitrate, and total Kjeldahl nitrogen at the lakeside of Lake Ontario near Twelvemile Creek.

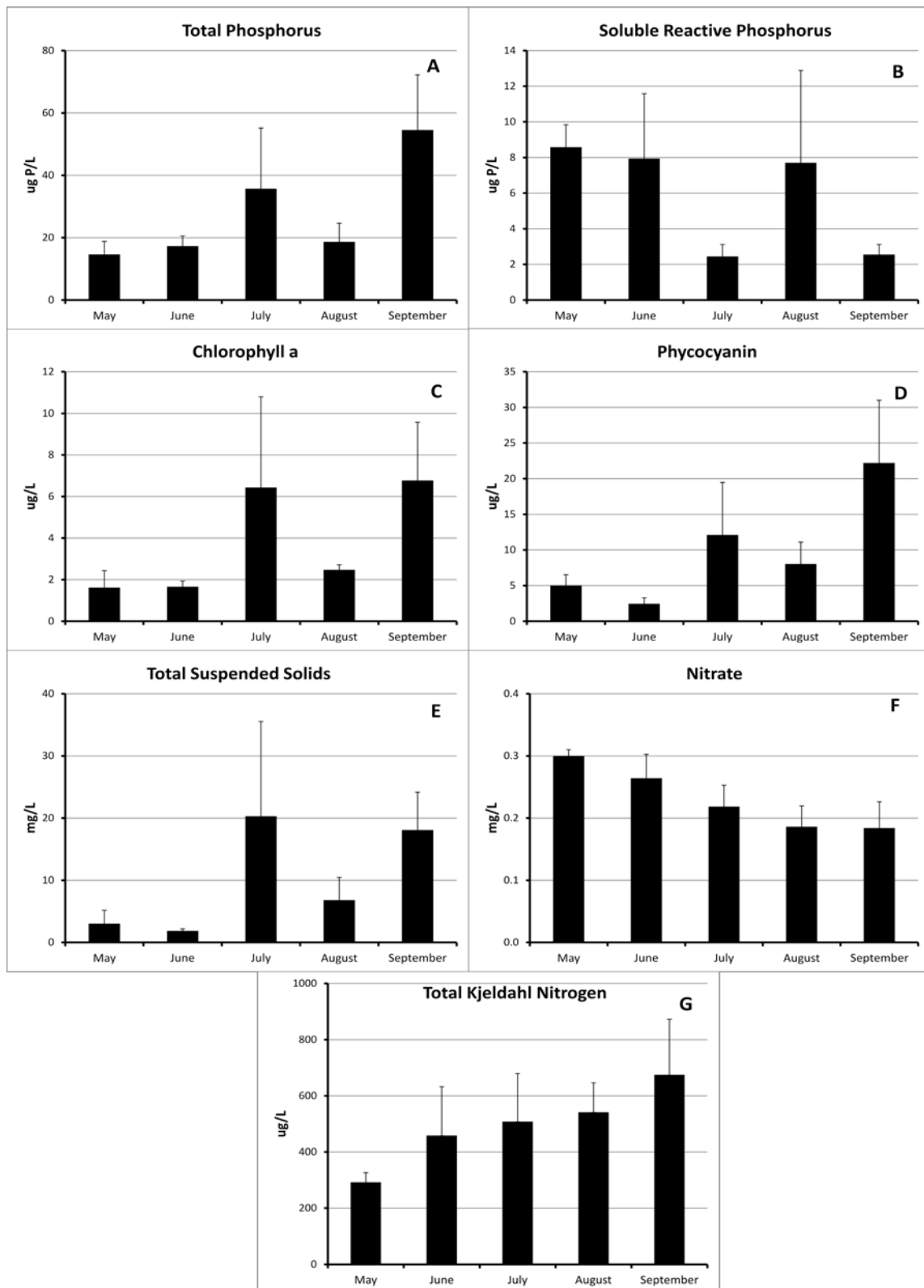


Figure 3. Average (\pm S.E) seasonal concentrations of total phosphorus, soluble reactive phosphorus, chlorophyll a, phycocyanin, total suspended solids, nitrate, and total Kjeldahl nitrogen in Twelvemile Creek.

